

# Sustainability of Implementing Enterprise Architecture in the Solar Power Generation Manufacturing Industry

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**Abstract:** In recent years, Solar power plants are currently developed rapidly, where solar power plants don't cause environmental damage. This generator utilizes sunlight as its input source which environmentally friendly, when sunlight is converted into direct current and voltage that can be stored in batteries. Therefore, the solar energy industry needs to have high efficiency, competitive pricing, and durability. With the right information technologies and developing application systems, it can help to optimize business processes and integrating information systems. But the fact there are many industries that do not apply information technology correctly into their business. In this research, provide to the best solution for applying the enterprise architecture framework correctly. The purpose of this paper is to design a manufacturing industry information system that is in accordance with the business model canvas and enterprise architecture. The design also discusses the development of a large and integrated information system with other systems. The study of Business Model Canvas is a business model that can explain and focus on nine business aspects with a solid strategy. Studies of the ArchiMate core Framework is the framework used to classify elements of the ArchiMate core language. These two methods are expected to be able to design an enterprise information system architecture consisting of business architecture, application architecture, information architecture and technology architecture as a result of the study. The result is a more complete system design to meet system requirements for users, integrated with existing system modules and no system duplication occurs.

**Keywords:** Manufacturing Industry Enterprise Architecture, Solar Power Plants, Business Model Canvas, ArchiMate Core Framework, The Open Group

## INTRODUCTION

Currently, the need for electricity is needed by the community to carry out daily life. This need must be proportional to the electricity supply. But the fact is that the demand for electricity is increasing and the electricity supply should provide more without damaging the environment. By building power plants by relying on generating sets (gensets) that require oil and coal as raw materials; pollute the environment. Environmental damage will be severe if it is not immediately built with more environmentally friendly plants, it is certain that next year will experience electrical energy problems.

For this reason, awareness is needed to take advantage of power plants that are always abundant, such as sunlight as a power supply. Of course, to hold solar power plants can be built with individuals, community groups, the private sector or the government. The use of business model canvas has expanded (Braun et al., 2021), ranging from current business models to future business models, can use the business model canvas. With a simple presentation method with nine elements, the business model canvas is able to become a business model analysis tool for (Strulak-Wójcikiewicz et al., 2020). Although simple, the business model canvas can help companies to get focus on the company's perspective on the business (Gamede et al., 2019). The method used for modelling and assessing and transforming a business uses the Business Model Canvas (Ferranti & Jaluzot, 2020). Complex systems can be managed and in accordance with the business, using enterprise architecture methods so that information technology can be invested (Dumitriu & Popescu, 2020).

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Manufacturing companies engaged in the electrical panel business, such as assembling generators, distribution panels and lighting panels, have a very advanced business unit, namely the solar power plant assembly unit. Currently, this manufacturing company already has an application system to support business processes from sales, production estimation, production implementation, spare part needs, inventory to the accounting system that has been running well.

However, the problem is that the application system cannot support the need for a solar power generator assembly unit. Organizationally the company has separated its business units into a solar power assembly business to grow to a large size with the arrival of new investors, a bigger market and a bigger industry.

One of the challenging issues facing modern industries today is how to cope with the new opportunities and greater challenges for organizations to manage enterprise, services, data, business function, mission areas, product lines, software system, etc as its entity in a better architecture strategy. In this paper we will try to address better architecture-related decisions that are more effective and efficient architectures and improve architecture maturity in a solar power plant manufacturing company, in order to visualize a more reliable system and meet the company's ICT needs. So that the ICT services of manufacturing companies are maximized and in accordance with changes in industry 4.0 technology. In connection with the above description, the following problems arise: How to develop a complete and integrated information system with existing application systems in the Solar Cell manufacturing industry (RQ1) and how to combine both Business Model Canvas and ArchiMate Core Framework methods from The Open Group? (RQ2).

State-the-of-Art, this paper is the underlying design of this ArchiMate core framework with realizes SMART system through sustainable system application and improves the efficient business process from enterprise resource planning to customer relationships in one system based on a cloud platform.

So aims that the ICT services of manufacturing companies are maximized and in accordance with changes in industry 4.0 technology. The development of enterprise architecture in this company has a very urgent urgency, especially in the development of integrated ICT, from sales to corporate profits. Every application system developed must comply with the enterprise architecture roadmap. Expectations from the use of enterprise architecture make the development of ICT systems in accordance with the company's IT Planning.

## LITERATURE REVIEW

Various definitions of Enterprise Architecture are the application of architecture in the context of enterprise information systems to understand and design systems that will be developed by organizations, companies or governments. As a result, several EA frameworks emerged, which are the cause of the plurality of EA definitions.

This definition of Enterprise Architecture varies greatly in scope and variety of purposes (Lapalme, 2011), (Korhonen, J. J., & Poutanen, 2013). One reference to Enterprise Architecture is ISO/IEC/IEEE 42010:2011, which is defined as the basic architecture in managing an organization and is realized in the form of components and the environment (ISO/IEC, Systems and Software Engineering-Architecture Description, 2011). One of them is the TOGAF framework, where the TOGAF framework is very well known (Matthes, 2011), (Group, 2013).

In addition to the definition from IEC/IEEE 42010:2011, Enterprise Architecture is considered as the science that manages organizational architecture, and the results are defined as follows:

"Enterprise architecture is a fundamental science that manages the organization which is related to the components and the relationship between the environment and the principles in managing the design of the system."

Some opinions about enterprise architecture:

According to (Lukiyanto & Wijyaningtyas, 2020), "Enterprise is defined as an activity that has a purpose and provides mutual information with other resources". Enterprise Architecture (EA) is a strategy that companies carry out with very fast changes, following the rhythm of the market and gaining a global perspective (Gonçalves et al., 2021). One of the tools to develop enterprise architecture is ArchiMate which has the ability to describe the architecture and is an integrated architecture. Library et al. (2017).

There are several general opinions, that Enterprise Architecture (EA) is a science for designing enterprise management based on methodologies, principles, frameworks, models, technologies and reference standards. In addition, it aims to support business units by including ICT solutions that are in accordance with existing business units (Pankowska, 2019). Proposed enterprise architecture modelling for strategic information systems and information systems and information technology development (Sari et al., 2019).

## METHOD

The methodology used in the Business Model Canvas (Brunner & Wolfartsberger, 2020) (Shimasaki, 2020) consists of nine elements. The following is an explanation of the nine elements of the business model canvas: Customer Segments, Customer Relationships (Michalik et al., 2018), Channels, Value Propositions, Key Activities, Key Resources, Key Partnerships, Cost Structure, Revenue Streams (Osterwalder et al., 2010).

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**Customer Segments** are components of a business that serve customers. **Customer Relationships** are components that establish relationships between those who have business and customers. **Channels** are the components of a business that deliver products to customers. **Value Propositions**, this is part of product and service excellence **Key Activities**, all activities to support the activities of the manufacturing industry that generate value or profit for sales. **Key Resources**, this is the management of resources in carrying out business activities. **Key Partnerships**, this is a good relationship between the organization and business partners. **Cost Structure**, is a component that manages business costs effectively. **Revenue Streams**, manage all business activities to generate revenue.

The methodology used in the ArchiMate Core Framework has three aspects and three layers (Buchalcevoa, 2019). Aspects are described as follows: **Active Structure**, described in the structure of elements such as business actors, application components, and display devices for actor behavior. **Behavior** or activities are described as processes, functions, events, and services; performed by the actors. Elements of behavior is a unit of activity carried out by active structural elements. **Passive structure**, which is defined as the object where the behavior is performed; these are usually information objects in the Business Layer and data objects in the Application Layer, and Technology is used to represent physical objects. Layers that can be described as follows: **The business layer**, described in the business services offered to customers, is realized in the organization through business processes carried out by business actors. **The application layer**, defined as the application services that support the business and the applications that make it happen. **Technology Layer**, defined as technology services such as processing, storage, and communication services.

Through the information systems approach, the best foundation in visualizing business strategy and system development is enterprise architecture.

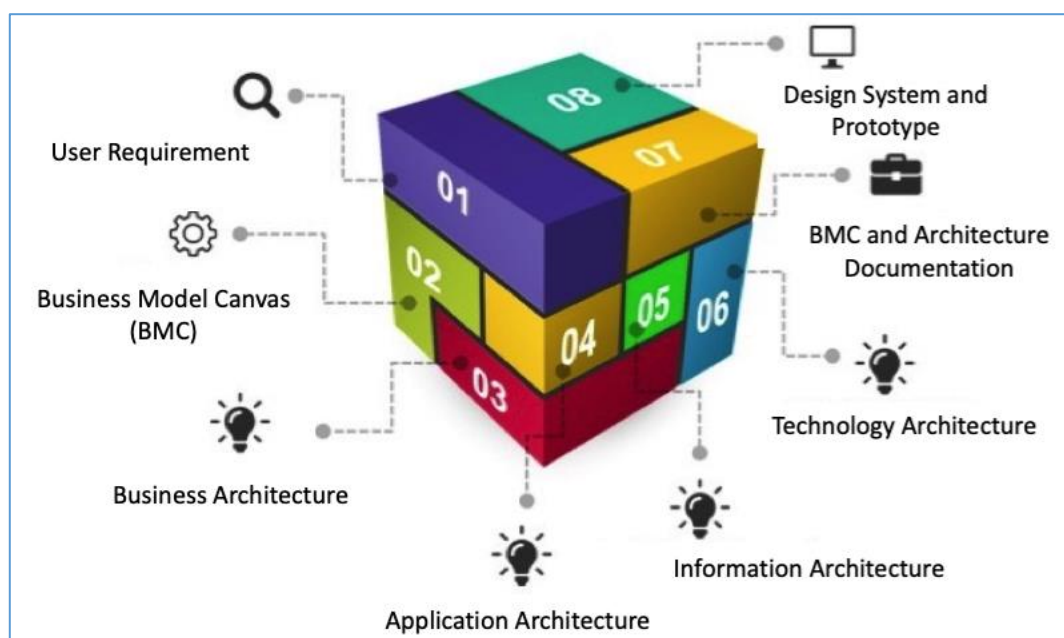


Fig 1. Proposed research methodology

The definition of enterprise according to The Open Group is a collection of organizations that have a common goal. Examples of enterprises are organizations, companies and agencies or departments (Cameron & McMillan, 2013). In this methodology, the author proposes a methodology as shown below because it is more in line with conditions in the manufacturing industry.

Methodology explanation:

**Analyze needs.** An analysis is one strategy to meet user needs for the system to be developed (Cicchetti, 2021), (Esztergár-Kiss & Lopez Lizarraga, 2021). The next step is to register user requirements. Next is to analyze user needs and cross-check with the system to be developed. This step avoids duplication of user requirements with the system to be developed (Thomas, 2021), (Kifetew et al., 2021), (Lavalle et al., 2021).

**Business Model Canvas.** As a tool in translating user needs, system strategy, management, finance, consumers, suppliers, production processes according to the elements and poured into business ideas into a unified business model (Hamwi et al., 2021). This is very necessary to make a business and system development map. In

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the Business Model Canvas for solar cell manufacture, it is described in 9 elements. Customer segments, Customer Relationships, Value Propositions, Key Activities, Channels, Key Resources, Key Partnerships, Cost Structure and Revenue Streams.

**Business Architecture Creation.** Describe how the company to achieve business goals, using the vision by developing a business architecture. Concerns from stakeholders can be approached with an architectural roadmap approach, based on the gap between the business architecture and the company's targets (Group, 2013), (Řepa & Svatoš, 2019).

**Application Architecture Creation.** The development of the Application Architecture based on the business architecture and vision can be aligned (Ali & Kharofa, 2021). The relationship between Management, Supplier / Partner, Core Process, Customer and Back Office must be complementary. With the Application Architecture, business processes run according to the company's application system development plan. For example, in the Customer System, there is a Smart Ordering Customer System module. This system develops a manual system that is replaced with a smart system, meaning that orders are directly made by the customer and order is immediately carried out by the system, and the customer will be notified if the customer makes a payment, after which the estimated delivery of the goods will arrive on time. This system does not involve operators in making orders and directly enters the finance department without any administrative operators.

**Making Information Architecture.** Contains a database as a data store from the application system (Bi et al., 2021). The database in its storage should not have duplication, and database relations are also made to be efficient in save and load operations. Due to a lack of knowledge in managing large databases, database access is slow. The design of the database system must meet the rules of database management. Backup and restore procedures must also be carried out, considering that the database function is very important so that the database cannot be lost or corrupted.

**Making Technology Architecture.** The design of the technology architecture (Jose et al., 2020), (Al-Kfairy et al., 2020) is very important, considering that a robust application system must also be supported by good hardware technology and in accordance with the needs of the application system. In carrying out a hardware implementation, apart from system requirements, it must be planned for disaster recovery, high-speed network and network and data security. All systems are well planned.

**Relationship between BMC and ArchiMate.** Implementation in the field of information technology has many cases, ranging from cases of failure to cases of success. One of them is that the system cannot translate according to user requirements. This research needs to be proposed to obtain complete information on user requirements by using a business model canvas. After that, translate it into ArchiMate tools to get a model that will be developed. Business model canvas is a summary of all system requirements, ArchiMate is a model for developing system prototypes. In principle there should be a relationship between BMC and ArchiMate. (Meertens et al., 2012), (Yamamoto et al., 2019).

**Design System ArchiMate.** The design using ArchiMate (Bhattacharya, 2017), (Azevedo et al., 2015) aims to translate all user requirements in the Business Model Canvas into a high-level system design. This design becomes a roadmap starting from Business Architecture, Application Architecture, Information Architecture, Technology Architecture and is interconnected with one another. Design using ArchiMate as a powerful tool in presenting aspects of Enterprise Architecture.

## RESULT

The purpose of designing an information system for the solar power plant manufacturing industry is to make adjustments between the Business Model Canvas (BMC) and the Enterprise Architecture in this case, using the ArchiMate tool. This design discusses the development of a large information system, meets user requirements and is integrated with the system that has been built. It is hoped that the Business Model Canvas study is a business model that can explain the latest user requirements and focus on nine business aspects with a solid strategy. The study of ArchiMate's core framework is the framework used to classify elements of ArchiMate's core language. These two methods are expected to be able to design an enterprise information system architecture consisting of business architecture, application architecture, information architecture and technology architecture. The result is a complete system design to meet system requirements for users, integrated with existing system modules, and no system duplication occurs.

## DISCUSSIONS

The discussion on the business model canvas and enterprise architecture methods focuses on Business Architecture (Tan et al., 2021), Application Architecture, Information Architecture and Technology Architecture. According to the Business Model Canvas (Burggräf et al., 2021), there are nine areas that describe organizational activities so that they have value to serve customers.

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The following is an explanation of the nine areas of the business model canvas:

**Customer Segment;** Currently, to support energy savings, especially electrical energy, as a business, it is necessary to create many opportunities, one of which is manufacturing for the manufacture of solar power generating devices. **Customer Relationships;** The focus of customer relationships is to provide good relationships with customers. The hope is to get feedback from customers so that they can provide better products. **Channels:** Product sales activities or increase sales using direct selling, agents or distributors. The goal is to create a sales network in order to increase product sales. **Value Propositions:** The value proposition of this manufacturing business is the product of solar power generation devices. The criteria are good quality, easy to maintain and cheaper maintenance costs. The approach can be done with the motto the best product, which means doing better manufacturing. **Key Activities:** The main activity in manufacturing is designing good products. Looking for the best and cheap materials, components to get the best quality. **Key Resources:** The main key of resources for solar power generating equipment products include labor salary, raw materials (materials, spare parts), knowledge (skills), finance, business network. The five elements will produce the best product. **Key Partnerships:** The main key of the partnership is to strengthen product sales and support product sales. Selling a great product requires the importance of building a strong partnership. **Cost Structure:** The cost structure in the manufacture of solar power generation equipment is fixed costs, variable costs and investment costs. Here are the costs to run manufacturing. Fixed cost; employee salaries, legal and insurance. Variable costs such as production costs, sales and marketing, product delivery services, product sales tax, customer service. **Revenue Streams:** Revenue streams for solar power generation equipment manufacturing (Rosário Cabrita et al., 2016) are sales of finished products, sales of semi-finished products, maintenance services and electrical consulting services. By designing an information system using the canvas business model, you will get a complete picture of the company's business process needs.

Table 1. Key Partnerships and Key Activities

No	Key Partnerships	No	Key Activities
1	Delivery Product (JNT, JNE, GRAB, etc.)	1	Sales / marketing / projects.
2	Marketplace (Bukalapak, Shopee, etc.)	2	Agreements
3	Supplier (Spare-part electronic, battery, cables, panel, etc.)	3	Design website, promotion to social media (Facebook ads, google ads, IG ads, WA Story, Community)
4	Supplier relationship	4	Services maintenance
5	Buyer relationship	5	Sourcing material / spare-part (search raw material, spare part good quality and low price)
6	Distributor	6	Production / Implementation projects
7	Retailer	7	Samples product, Gallery, Workshop
8	Licenses and Franchises	8	Design finished products

Table 2. Value Propositions and Channels

No	Value Propositions	No	Channels
1	Best products	1	Marketplace
2	Good services and maintenance	2	Customer Loyal or End User
3	Quality control and testing for products	3	Distributor Loyal
4	Continues improvements for product and services	4	Social Media free or paid (Facebook Ads, Google ads)
5	More variety products	5	Project Owner
6	Customer satisfy	6	Mobile order and Pay apps
7	Customer experience	7	Apps Store
8	Lower cost operation user in power electric	8	Google Play
9	Lower cost maintenances	9	Mail and Notification
		10	Website

Table 3. Key Resources and Customer Relationships

No	Key Resources	No	Customer Relationships
1	Employee	1	Thank you/Card Member
2	Material, Spare-part, raw material	2	Cross Selling Product
3	Intellectual Knowledge	3	Knowledge Product to Customer

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4	Financial	4	Smart Customer Relationship Management
5	Network effect	5	Manage Image Company
6	Branch	6	Meet to customer (Online, Meeting, Visit to Customer)

Table 4. Customer Segments and Cost Structure

No	Customer Segments	No	Cost Structure
1	End user (Personal, Community)	1	Payroll
2	Real Estate, Telco, Manufacture	2	Production cost
3	Mosque, church	3	Sales/marketing
4	Central Park, Rural, island without electricity	4	Delivery Product
5	Mining, Power Plant	5	Enclosure, Box, Packing, Material, Spare-part
6	Reseller, Agent	6	Legal, Insurance
7	Distributor	7	Landscape, Building factory, Infrastructure
8	Public Service, Office Government	8	Customer Support
9	Sea and Air Port	9	Development & Expansion
10	Hospital, Hotel, Mall, Homes, Schools	10	Taxes

Table 5. Revenue Streams

No	Revenue Streams
1	Finished product
2	Semi-finish product
3	Maintenances
4	Consulting Services

### Application Architecture

Application architecture is the design of a comprehensive, integrated application system (Sun et al., 2016) so that it becomes a unified application system that is interconnected. The application architecture discussion includes Customer, Core Process, Supplier or Partner, Back Office and Management. The need for an information system to support the operations of the manufacturing industry related to customer service is as follows: **Customer Service**; There are several application systems that are used for customer service. The following systems are used to serve customers: **Core Process**; Core processes in the manufacturing industry require several application systems to support the production of solar power generating devices. **Supplier or Partner**; There are several application systems that are used for suppliers or partners to customers. The following table is used to serve suppliers or partners: **Back Office**; Internal companies need applications for business purposes or to support manufacturing business processes. Preparing resources (labor and materials or spare) needs to be done, so that production runs smoothly and on target. The following applications to support the system. **Management**; Management as the controller of all manufacturing business activities needs to get important and strategic information to run the manufacturing business.

Table 6. Customer and Core Process Application System

Code	Application System	Code	Application System
AC 1	Smart Ordering Customer System	AP 1	Smart Human Resources System
AC 2	System Promotion Social-Media	AP 2	Smart Planning, Production and Control System
AC 3	Tracking Product to Customer	AP 3	Smart Planning, Procurement & Inventory Management
AC 4	Cross Selling product	AP 4	Smart Assembly Production with IOT System
AC 5	Smart Drone Monitoring Zone	AP 5	Quality Control and Testing product
AC 6	Smart Bot for Prospect Customer System	AP 6	Finished product
AC 7	Smart Product Catalogue System	AP 7	Semi-finished product
AC 8	Smart Estimation Monitoring Order Customer	AP 8	Smart Packaging System
AC 9	Smart Maintenance Online	AP 9	Smart Delivery product
AC 10	Smart Marketplace Ads System	AP 10	Request Customer Maintenances

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AC 11	Customer Loyalty System	AP 11	Process maintenance
AC 12	Smart Communication with Customer	AP 12	Deliver Maintenances
AC 13	Smart Sales Marketing Project	AP 13	Smart Request Consulting
AC 14	Sales/Marketing/Project	AP 14	Consulting Process
AC 15	Smart Model Product PLTS	AP 15	Deliver Consulting Product
AC 16	Smart Drone Delivery Product	AP 16	Online Shop Product PLTS
		AP 17	Online Payment
		AP 18	Customer Review

Table 7. Supplier/Partner and Back Office Application System

Code	Application System	Code	Application System
AS 1	Inventory Finish Product and Semi product Control	AR 1	Smart Schedule for Maintenance
AS 2	Smart Procurement Management	AR 2	Smart Consulting Project Price and Schedule
AS 3	Smart Partner Training & Certification System	AR 3	Smart Attendance System
AS 4	Smart Vendor Management	AR 4	System Standard Operation Procedure Document
AS 5	Smart Channel Partner Portal	AR 5	Smart Legal System
AS 6	Smart Distribution Channel and Supplier	AR 6	System Automation Reminder Payment Schedule
AS 7	Smart Channel Deal Registration	AR 7	Smart Intellectual Knowledge and Learning System
AS 8	Smart Marketplace System	AR 8	Smart Customer Satisfy System
AS 9	Smart Partner Relationship Management	AR 9	Smart Quality Control & Testing Product
AS 10	Smart Channel Partner Recruitment System	AR 10	Smart Asset Management System
AS 11	Smart Marketing Development Funds System	AR 11	Data Science for Business PLTS System
AS 12	Smart Social Sharing & Collaboration System	AR 12	Automatic Power System with IOT
AS 13	Smart Joint Business Strategy Planning System	AR 13	Building Management and Control System

Table 8. Management Application System

Code	Application System
AM 1	Financial Information System
AM 2	Smart Revenue System
AM 3	Smart Sales Information System
AM 4	Smart Cost Production PLTS System
AM 5	Smart Prospect and Analytics Business Product
AM 6	Smart Dashboard for Product
AM 7	Smart investment for business products
AM 8	Smart Partner Management Dashboard System
AM 9	Executive Management System

### Information Architecture

This information architecture is the flow of information into the database. For the application system, a separate database is needed, making it easier to manage the database (Rédei, 2008). The database is a collection of meaningful facts that can be recorded. A database system is a computerized system that can perform storage and other database operations (Rédei, 2008). A query is data manipulation or managing data in the Database Management System (Vavilis et al., 2015), where the use of queries will produce specific data or information.

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### 1. Manufacturing of solar power generation device products

Daily activities in making production goods, both finished goods and semi-finished goods. Making a product manufacturing support application system requires an application system and database related to product manufacturing.

### 2. Maintenance Service or Maintenance Service

In addition to the activities of producing solar power generation equipment, they are developing a business unit for solar power generation equipment maintenance services. The maintenance service unit activities require a system with enterprise architecture.

### 3. Project Consulting Service

The maintenance service unit activities require a system with enterprise architecture. The following are the applications needed to support the operations of the consulting service business unit.

Table 9. Product *manufacturing database*

Code	Application System
AC 1	Db. Smart Ordering Customer
AP 1	Db. Smart Human Resource Management
AP 2	Db. Smart Planning, Production and Control
AP 3	Db. Smart Planning, Procurement & Inventory
AP 4	Db. Smart Assembly Production with IOT
AP 5	Db. Smart Quality Control and Testing
AP 6	Db. Smart Finished Product
AP 7	Db. Smart Semi-Finished Product
AP 8	Db. Smart Packing System
AP 9	Db. Smart Delivery Product
AC 16	Db. Smart Drone Delivery Product

Table 10. Maintenance Service and Consultant Services Database

Code	Application System	Code	Application System
AP 1	Db. Smart Human Resource Management	AP 1	Db. Smart Human Resource Management
AP 5	Db. Smart Quality Control and Testing	AP 5	Db. Smart Quality Control and Testing
AP 10	Db. Smart Request Maintenance	AP 13	Db. Smart Request Consulting
AP 11	Db. Process Maintenance	AP 14	Db. Consulting Process
AP 12	Db. Delivery Maintenance	AP 15	Db. Delivery Consulting Product
AR 1	Db. Smart Schedule for Maintenance	AR 2	Db. Consulting Project Price and Schedule

### Technology Architecture

This technology architecture aims to design systems using hardware technology and network devices to support the Industrial Enterprise Architecture.

Table 11. Back Office and Supplier Hardware

Code	Back Office Hardware	Code	Supplier/Partner Hardware
BO 1	Back Office Server	SU 1	Supplier Server
BO 2	Back Office Backup Server	SU 2	Supplier Backup Server
BO 3	Switch	SU 3	Switch
BO 4	Router	SU 4	Router

Table 12. External Management Hardware

Code	External Hardware	Code	Management Hardware
ES 1	External Server	MH 1	Management Server
ES 2	External Backup Server	MH 2	Management Backup Server
ES 3	Switch	MH 3	Switch
ES 4	Router	MH 4	Router

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Table 13 Core Process Hardware

Code	Core Process Hardware
CM 1	Core Process 1 server
CM 2	Core Process 2 server
CM 3	Core Process 1 backup server
CM 4	Core Process 2 backup server
CM 5	Intrusion Detection System
CM 6	Intrusion Prevention System
CM 7	Core Network Management
CM 8	Network Operation Center (NOC)
CM 9	Security Operation Center (SOC)

The business of the manufacturing industry has three units as follows:

**Production of solar power generation devices**

The production process starts from the customer placing an order for the product, the customer order receiving section is recorded by the Smart Ordering Customer [AC 1] system and stored in the DB database. Smart Ordering Customers. The next process sends data to [AP 2] Smart Planning, Production and Control System. This system also gets resource data supply from [AP 1] Smart Human Resource Management. [AP 2] Smart Planning, Production and Control System and [AP 3] Smart Planning, Procurement & Inventory Management System continue the process to manage production schedules, manage inventory and supply materials. [AP 4] Smart Assembly Production with IOT System continues the process to assemble materials into finished or semi-finished products. In assembling the material using a robot, and the robot sends data to the next process. [AP 5] Smart Quality Control and Product Testing processes information from the results of the testing process for finished and semi-finished products to maintain quality. Product testing results in the form of data, will be entered into the database. [AP 6] Smart Finished product and [AP 7] Smart Semi Finished product is a system that processes data from [AP 5] Smart Quality Control and Testing product, into the DB database. Finished product and DB. Semi-finished product. [AP 8] Smart Packaging System, processes product data and is ready to pack for the next process. There are 2 product delivery processes in this manufacturing business. Product delivery with [AP 9] Smart Delivery Product is carried out under normal conditions, [AC 16] Smart Drone Delivery Product for deliveries that are difficult to reach. Notifications to customers containing information on delivery of goods are sent from the [AP 9] Smart Delivery Product system or from the [AC 16] Smart Drone Delivery Product system.

**Product maintenance services**

When there is damage to the solar power generation device, the customer contacts customer service to ask for repairs. From the results of complaints from customers regarding damage problems, the process has been included in [AP 10] Smart Request Customer Maintenance and has been included in Customer Relationship Management. The system will send to [AR 1] Smart Schedule for Maintenance, for further processing. For the work process, the [AR1] system requires resources and determines a team of technicians to work on and the [AP 1] Smart Human Resource Management system provides technician data to be processed in work schedule. [AP 11] Process maintenance, preparation for maintenance (spare parts, documentation and tools for technicians), determination of technician team, determination of schedule from [AR 1] Smart Schedule for Maintenance. After the technician team arrived at the site, maintenance work was carried out, starting to check until it was finished and everything was recorded in [AP 11] Process maintenance. All activities are also tested to ensure maintenance work and stored in [AP 5] Smart Quality Control and Testing product. All product maintenance activities are stored in the [AP 12] Deliver Maintenances system and the system sends a notation to the customer.

**Product consulting services**

Information obtained from sales or marketing from product promotion through the Customer Relationships Management system is then processed through the [AP 13] Smart Request Consulting system. [AR 2] Smart Consulting Project Price and Schedule and system [AP 1] Smart Human Resource Management, in consulting work, what is needed is an engineer who understands the technology of power generation equipment, so that as a result, the engineer can estimate or estimate project costs or consultation. Furthermore, Quality Control is carried out whether the work is correct and entered into the [AP 5] Smart Quality Control and Testing product system.

All project estimation calculation activities are completed then entered into the AP system 15] Deliver Consulting Product and the system notifies customers. 4. Design for 3 manufacturing industry business units. Design or

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prototype for the manufacturing industry. as follows, the applications related to the 3 business units of the manufacturing industry are discussed. In this case, it is widely discussed and integrated between the interrelated parts of the business unit.

The following is a discussion of the two methods:

The discussion carried out in this study is to use two complementary methods. Where the discussion of cost and revenue is discussed in the business model canvas method, while ArchiMate does not discuss it. Customer segments and partners are discussed in more detail in the business model canvas, while ArchiMate is more concerned with external roles and actors because ArchiMate discusses in more detail about behavior actors.

Value proposition, relationships and channels are discussed in the business model canvas, while ArchiMate discusses external business services. The business model canvas discusses activities although it is not as detailed as ArchiMate, ArchiMate discusses in more detail the business processes of internal actors or roles, external application services, and application components.

Business model canvas discusses resources, and ArchiMate discusses external Infrastructure Services and Infrastructure. The external actors in the ArchiMate method, which in the case of the Business Model Canvas, are the customer segments and their partners. ArchiMate does not discuss costs and revenues. Evidently, that the Business Model Canvas describes the business model and its components can be compared to the ArchiMate business layer. The activity section can be equated with external application services. Resources in the ArchiMate technology layer are aligned with the Business Model Canvas resource component, but are not identified as technology components. In this case the research does not compare the Business Model Canvas method with ArchiMate. But using both methods that complement each other so as to get maximum research results in Enterprise Architecture.

### Strategy and implementation

Gap analysis on the enterprise architecture and business model canvas has differences between the baseline architecture and the target architecture, namely the business view, company organization, data and information, and technology. The migration stages from start to finish are divided into several stages according to the company's goals. It takes time to implement and evaluate to fit the company's organizational planning. The application system will be divided into several modules and sub modules.

At the stage of implementation of the application system, it is necessary to prioritize each module or submodule of each large application system with the aim that the information system needs can support the company's operations. So that the implementation stages of the application system module or submodule can produce data to be used for company decisions, even though the application system is under development.

The strategy needed is to implement each module or submodule of the application system in accordance with the order of priority of the company's needs. The initial stage is prioritized in handling the company's sales, inventory and production, the second stage prioritizes organizational costs and company revenue. Until all the company's information system needs can be met in accordance with the order or priority of the implementation of the information system.

Based on this principle, a data-driven application implementation sequence can be generated, so that the resulting data can be used by applications that will be implemented next.

### CONCLUSION

The results of the preparation of research on enterprise architecture in the solar power plant manufacturing industry, can answer the first research question and second research question. Development and implementation into software will be easier because the mapping of business processes is clearer and if it is integrated with other application systems it becomes easier. The strategi implementation has been explained based on the priority scale of the company's information system needs. It becomes very complete because it uses the business model canvas, the enterprise architecture method and the ArchiMate Core Framework method from The Open Group (TOGAF). The review in terms of application architecture, information architecture and technology architecture complement the review from various perspectives of enterprise architecture methods.

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